MULTIMEDIA UNIVERSITY*

STUDENT ID NO

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# MULTIMEDIA UNIVERSITY

# FINAL EXAMINATION

**TRIMESTER 3, 2022/2023**

## BMM1014 – MATHEMATICS FOR MANAGERS

(All sections/Groups)

6 OCTOBER 2023
9.00 a.m – 11.00 a.m
(2 Hours)

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## INSTRUCTIONS TO STUDENT

1. This question paper consists of 6 pages with 4 questions only.
2. Attempt **all FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.
4. Formulae are attached at the end of the question paper.
5. Students are allowed to use scientific calculators (without restriction).

## Question 1

a) PQR Sdn. Bhd. primarily manufactures wooden furniture for export. The variable cost of producing a set of wooden sofas is RM 4,300, and each set is sold for RM 7,500. The company's fixed cost amounts to RM 144,000.

(i) Formulate the cost function, revenue function and profit function based on the above given information. (3 marks)

(ii) How many sets of wooden sofas that the company need to produce and sell each month in order to achieve break-even? (3 marks)

(iii) How many sets of wooden sofas that the company need to sell in order to achieve a profit of RM 500,000? (3 marks)

(iv) What is the new selling price of the tablet if the company wishes to obtain a profit of RM 800,000 by selling 250 sets of wooden sofas per month? (4 marks)

b) A farmer plans to plant three types of fruit trees: mango trees, banana trees, and rambutan trees on a piece of 220 acres land. He will use two types of fertilizer for these trees. Mango trees require 12 units of Type 1 fertilizer and 18 units of Type 2 fertilizer. Banana trees need 15 units of Type 1 fertilizer and 8 units of Type 2 fertilizer, while rambutan trees require 18 units of Type 1 fertilizer and 8 units of Type 2 fertilizer. A total of 2910 units of Type 1 fertilizer and 3260 units of Type 2 fertilizer are available. How many acres of land should be allocated to each type of fruit tree? (12 marks)

(Total: 25 marks)

**Continued...**

## Question 2

An event organizer is in the process of arranging a talk show to be held at an auditorium. The talk show will offer two categories of tickets: member tickets and non-member tickets. The auditorium's maximum capacity is 600 people. Member tickets are priced at RM 250 per person, while non-member tickets are priced at RM 200 per person. The total revenue generated by the talk show is targeted to be at least RM 100,000. To meet this target, the event organizer aims to sell a minimum of 150 member tickets and 100 non-member tickets. However, due to space limitations in the auditorium, the sale of member tickets cannot exceed 250, and non-member tickets cannot exceed 400. The profits gained from the selling of member and non-member tickets are RM 105 and RM 85 respectively.

a) Formulate the above problem as a Linear Programming problem to maximize the profit. (7 marks)

b) Graph and show the feasible region of the above problem clearly. (6 marks)

c) How many tickets for member and non-member should be sold by the event organizer to obtain the maximum profit? What is the maximum profit? (12 marks)

(Total: 25 marks)

**Continued...**

**Question 3**

a) What is the principal amount that needs to save in a saving plan that pays 3.5% annual simple interest to earn interest of RM 3,780 after 5 years? (4 marks)

b) Find the accumulated amount after 8 years if RM 5,850 is deposited in an investment plan that earns interest at a rate of 6.75% compounded monthly. (4 marks)

c) Find the principal amount of an investment if the investment plan accumulated an amount of RM 17,710 at the interest rate of 2.8% per year for 4 years compounded continuously. (4 marks)

d) How much of the loan amount that Nicole can secured from the bank if she is affordable to pay RM 455 per month for 42 monthly installments and the bank will charge interest of 3.1% compounded monthly? (4 marks)

e) Janice has set a saving target to get RM 50,000 at the end of 3 years. She has subscribed to a saving plan which will pay interest of 4.67% compounded quarterly.

(i) What is the quarterly payment that Janice needs to deposit into the saving plan? (5 marks)

(ii) How much interest that Janice has earned for the entire term of this saving plan? (4 marks)

(Total: 25 marks)

**Continued...**

**Question 4**

a) The profit, P(x) (in thousands of RM) of selling x thousand units of the product can be represented by the function of

$$P(x) = -\frac{5}{3}x^3 + 25x^2 + 480x + 638$$

How many units of the product must the company produce and sell in order to maximize profit? What is the maximum profit? (10 marks)

b) Evaluate the definite integral below

$$\int_1^3 (3x^4 + 4x + 6e^x)\, dx$$

(5 marks)

c) The production time (in hours) of producing x thousands units of product A and y thousands units of product B is given by

$$T(x, y) = 27x^3 + 8y^2 - 72xy + 1550$$

How many units of each model of product can be produced in order to get minimum time spent? What is the minimum time spent? (10 marks)

(Total: 25 marks)

**End of Paper**

# LIST OF FORMULAE

## 1. Quadratic Formula

The solution of the equation $ax^2 + bx + c = 0, a \neq 0$, are

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

## 2. Simple Interest

Interest, I = Prt
(P = principal, r = interest rate, t = number of years)

Accumulated amount, A = P (1 + rt)

## 3. Compound Interest

Accumulated amount, $A = P(1 + i)^n$,
where i = r/m, and n = mt (m = number of conversion periods per year)

## 4. Continuous Compound Interest

$A = Pe^{rt}$

## 5. Effective Rate of Interest

$r_{eff} = (1 + r/m)^m - 1$

## 6. Present Value for Compound Interest

$P = A(1 + i)^{-n}$

## 7. Future Value of an Annuity

$$S = R\left[\frac{(1 + i)^n - 1}{i}\right]$$

(S = future value of ordinary annuity of n payments of R dollars periodic payment)

## 8. Present Value of an Annuity

$$P = R\left[\frac{1 - (1+i)^{-n}}{i}\right]$$

(P = present value of ordinary annuity of n payments of R dollars periodic payment)

**9. Amortization Formula**

$$R = \frac{Pi}{1-(1+i)^{-n}}$$

(R = periodic payment on a loan of P dollars to be amortized over n periods)

**10. Sinking Fund Formula**

$$R = \frac{Si}{(1+i)^{n}-1}$$

(R = periodic payment required to accumulate S dollars over n periods)

## Calculus

**11. Product rule**

$$f(x) = u(x).v(x)$$

$$f'(x) = u(x).\frac{dv}{dx} + v(x).\frac{du}{dx}$$

**12. Quotient rule**

$$f(x) = \frac{u(x)}{v(x)}$$

$$f'(x) = \frac{v(x)\frac{du}{dx} - u(x)\frac{dv}{dx}}{[v(x)]^2}$$